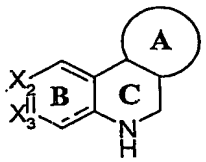
CLAIMS

What is claimed is:

1. A method of treating a subject for a bacterial infection, comprising administering to a subject in need of treatment for a bacterial infection an effective amount of a compound represented by structural formula I:



I

or a pharmaceutically acceptable salt, solvate, or hydrate thereof, wherein:

Ring **A** is a 5 or 6 membered cycloalkyl or cycloalkenyl group, optionally substituted with halogen or optionally halogenated C1-C3 alkyl or alkoxy;

X2 and X3 are each carbon, or one is nitrogen and the other is carbon; and

Rings **B** and **C** are optionally and independently substituted at any substitutable ring carbon, provided that one or two substitutable ring carbons in Rings **B** and **C** are substituted with an acidic group.

2. The method of Claim 1, wherein the subject is a human.

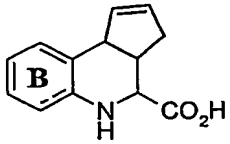
3. The method of Claim 2, wherein the infection is caused by a bacterium that expresses phosphoenolpyruvate:UDP-N-acetyl-D-glucosamine 1-carboxyvinyltransferase.

4. The method of Claim 2, wherein the infection is caused by a bacterium of a genus selected *Allochromatium, Acinetobacter, Bacillus, Campylobacter, Chlamydia, Chlamydophila, Clostridium, Citrobacter, Escherichia, Enterobacter, Enterococcus, Francisella, Haemophilus, Helicobacter, Klebsiella, Listeria, Moraxella, Mycobacterium, Neisseria, Proteus, Pseudomonas, Salmonella, Serratia, Shigella, Stenotrophomonas, Staphyloccocus, Streptococcus, Synechococcus, Vibrio*, and *Yersina*.

5. The method of Claim 4 wherein the bacterial infection is from [**correct list?**] *Allochromatium vinosum, Acinetobacter baumanii, Bacillus anthracis, Campylobacter jejuni, Chlamydia trachomatis, Chlamydia pneumoniae, Clostridium* spp., *Citrobacter* spp., *Escherichia coli, Enterobacter* spp., *Enterococcus faecalis., Enterococcus faecium, Francisella tularensis, Haemophilus influenzae, Helicobacter pylori, Klebsiella* spp., *Listeria monocytogenes, Moraxella catarrhalis, Mycobacterium tuberculosis, Neisseria meningitidis, Neisseria gonorrhoeae, Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella* spp., *Serratia* spp., *Shigella* spp., *Stenotrophomonas maltophilia, Staphyloccocus aureus, Staphyloccocus epidermidis, Streptococcus pneumoniae, Streptococcus pyogenes, Streptococcus agalactiae, Yersina pestis,* and *Yersina enterocolitica.*

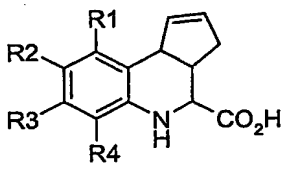
6. The method of Claim 5 wherein the acidic group is selected from -(CO)OH, -(CS)OH, -(SO)OH, $-SO_3H$, $-OSO_3H$, $-P(OR^a)(OH)$, $-(PO)(OR^a)(OH)$, $-O(PO)(OR^a)(OH)$, or $-B(OR^a)(OH)$, wherein R^a is –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl.

7. The method of Claim 6, wherein the compound is represented by structural formula **I-a**:



I-a

8. The method of Claim 7, wherein the compound is represented by structural formula **I-a'**:



I-a'

wherein:

R1, R2, R3, and R4 are independently –H, halogen, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)O(CO)R^b$, $-(CS)OR^b$, $-(CS)R^b$, $-(SO)OR^b$, $-SO_3R^b$, $-OSO_3R^b$, $-P(OR^b)_2$, $-(PO)(OR^b)_2$, $-O(PO)(OR^b)_2$, $-B(OR^b)_2$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-SO_2NR^c_2$, $-NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl;

wherein:

each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

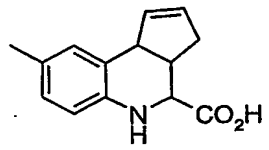
9. The method of Claim 8 wherein at least two of R1 to R4 are –H.

10. The method of Claim 9 wherein:

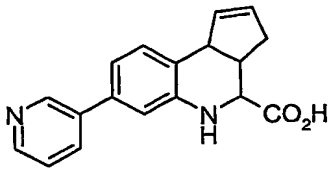
one or two of R1 to R4 are each independently -F, -Cl, -Br, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-NR^d(CO)PhNR^d(CO)R^b$, or optionally substituted phenyl, benzyl, pyridyl, methylpyridyl, or optionally halogenated C1 to C4 alkyl or C1 to C4 alkoxy;

wherein each R^b, R^c, and R^d is independently –H, or optionally substituted C1 to C4 alkyl or phenyl, or each NR^c_2 is an optionally substituted morpholinyl, piperidyl, or piperazyl.

11. The method of Claim 10 wherein the compound is represented by one of the following structural formulas:

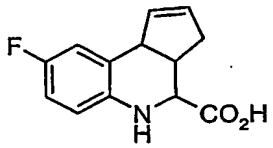


III



V

VI



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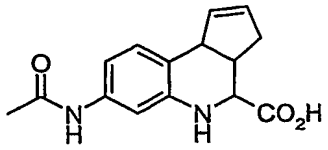

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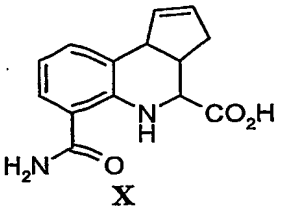
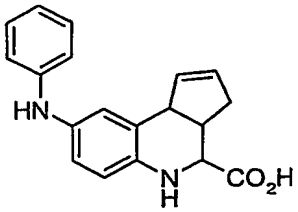


X



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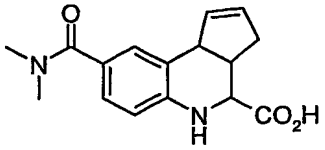

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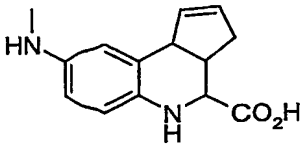

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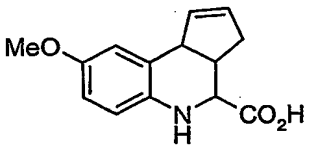

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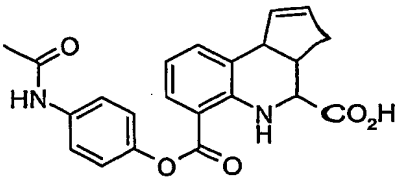

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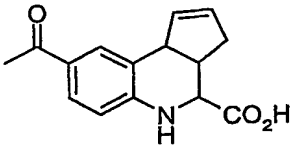
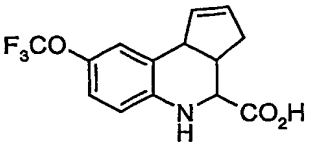
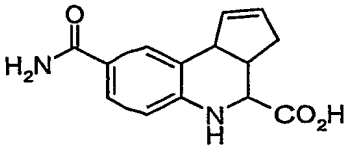


XVII



XVIII



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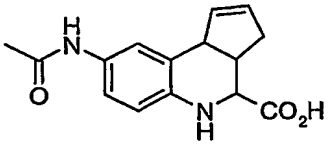

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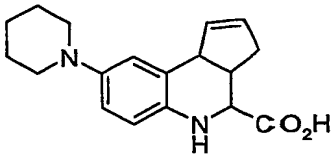
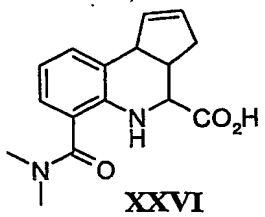
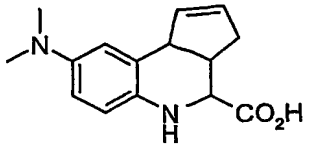


XXV



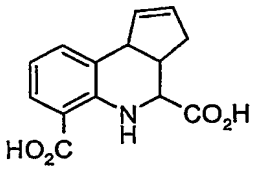
XXVI



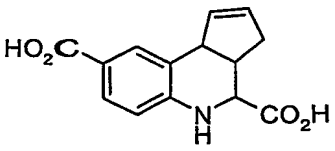
XXVIII

12. The method of Claim 8 wherein at least one of R1 to R4 is $-CO_2H$, or a C1 to C4 alkyl ester thereof.

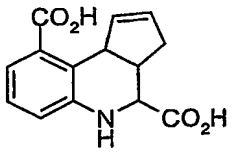
13. The method of Claim 12 wherein the compound is represented by one of the following structural formulas:



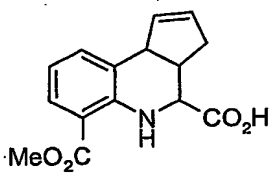
II



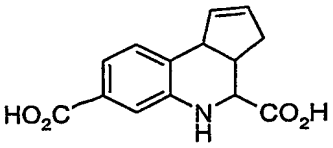
IV



VII

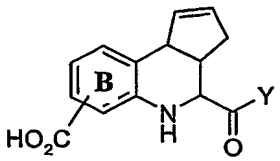


XX



XXI

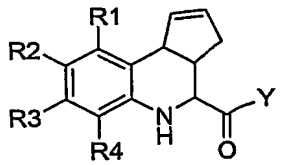
14. The method of Claim 6, wherein the compound is represented by structural formula **I-b**:



I-b

wherein Y is optionally substituted C1 to C4 alkyl, C1 to C4 alkoxy, phenyl, pyridyl, or $-NR^j_2$, wherein each R^j is independently –H, C1 to C4 alkyl, aryl, or aralkyl, or NR^j_2 is a nonaromatic heterocycle.

15. The method of Claim 14, wherein the compound is represented by structural formula **I-b'**:



I-b'

wherein:

R1, R2, R3, and R4 are independently –H, halogen, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)O(CO)R^b$, $-(CS)OR^b$, $-(CS)R^b$, $-(SO)OR^b$, $-SO_3R^b$, $-OSO_3R^b$, $-P(OR^b)_2$, $-(PO)(OR^b)_2$, $-O(PO)(OR^b)_2$, $-B(OR^b)_2$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-SO_2NR^c_2$, $-NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl, wherein at least one of R1 to R4 is $-CO_2H$;

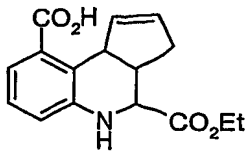
wherein:

each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

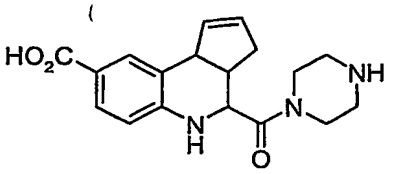
each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

16. The method of Claim 15 wherein at least two of R1 to R4 are –H.

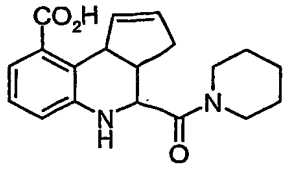
17. The method of Claim 16, wherein the compound is represented by one of the following structural formulas:



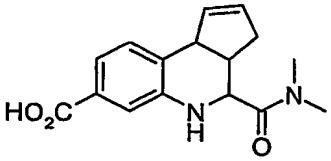
XIV



XXII

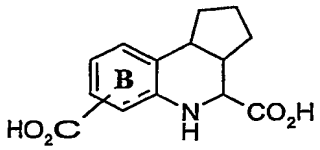


XXIV



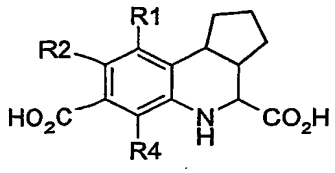
XXVII

18. The method of Claim 6, wherein the compound is represented by structural formula **I-c**:



I-c

19. The method of Claim 18, wherein the compound is represented by structural formula **I-c'**:



I-c'

wherein:

R1, R2, and R4 are independently –H, halogen, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)O(CO)R^b$, $-(CS)OR^b$, $-(CS)R^b$, $-(SO)OR^b$, $-SO_3R^b$, $-OSO_3R^b$, $-P(OR^b)_2$, $-(PO)(OR^b)_2$, $-O(PO)(OR^b)_2$, $-B(OR^b)_2$, $-(CO)NR^c{}_2$, $-NR^c{}_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c{}_2$, $-SO_2NR^c{}_2$, $-NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl,

heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl;

wherein:

each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

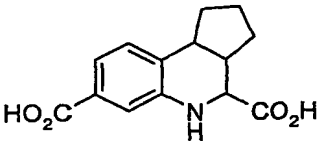
20. The method of Claim 19, wherein R1, R2, and R4 are independently –H, -F, -Cl, -Br, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-SO_2NR^c_2$, $-NR^dSO_2R^b$, or optionally halogenated C1 to C4 hydroxy alkyl, C1 to C4 alkyl, or C1 to C4 alkoxy;

wherein

each R^b, R^c and R^d is independently –H or C1 to C4 alkyl; or NR^c_2 is a nonaromatic heterocycle.

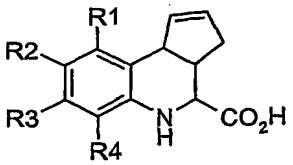
21. The method of Claim 20 wherein at least two of R1, R2, and R4 are –H.

22. The method of Claim 21 wherein the compound is represented by structural formula **I-m**:



I-m

23. A compound represented by structural formula **I-a'**:



I-a'

or a pharmaceutically acceptable salt, solvate, or hydrate thereof, wherein:

R1, R2, R3, and R4 are independently –H, -(CO)R^b, -(CO)OR^b, -(CO)O(CO)R^b, -(CS)OR^b, -(CS)R^b, -(SO)OR^b, -SO_3R^b, -OSO_3R^b, -$P(OR^b)_2$, -(PO)$(OR^b)_2$, -O(PO)$(OR^b)_2$, -$B(OR^b)_2$, -NR^c_2, -$NR^d(CO)R^b$, -$NR^d(CO)OR^b$, -$NR^d(CO)NR^c_2$, -$SO_2NR^c_2$, -$NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, C3 to C7 cycloalkyl, or nonaromatic heterocycle;

wherein:

each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

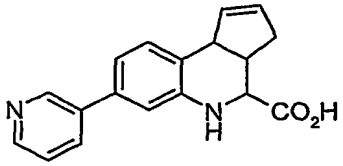
24. The compound of Claim 23 wherein at least two of R1 to R4 are –H.

25. The compound of Claim 24 wherein:

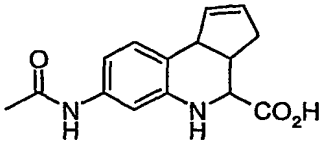
one or two of R1 to R4 are each independently -(CO)R^b, -(CO)OR^b, -(CO)NR^c_2, -NR^c_2, -$NR^d(CO)R^b$, -$NR^d(CO)OR^b$, -$NR^d(CO)NR^c_2$, -$NR^d(CO)PhNR^d(CO)R^b$, or optionally substituted phenyl, benzyl, pyridyl, or methylpyridyl;

wherein each R^b, R^c, and R^d is independently –H, or optionally substituted C1 to C4 alkyl or phenyl, or each NR^c_2 is an optionally substituted morpholinyl, piperidyl, or piperazyl.

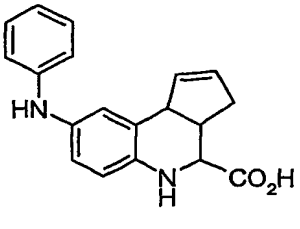
26. The compound of Claim 25 wherein the compound is represented by one of the following structural formulas:



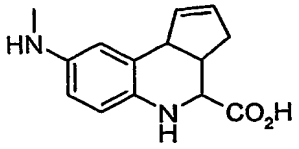
V



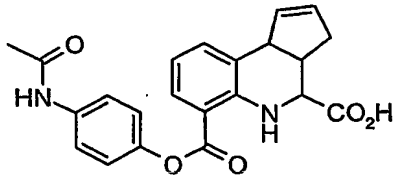
IX



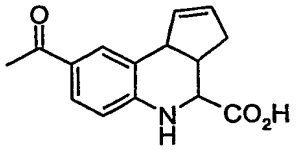
XI



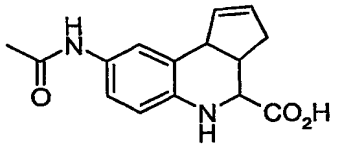
XIII



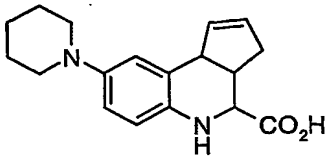
XVI



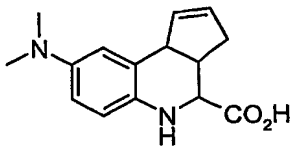
XVII



XXIII

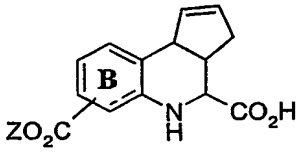


XXV



XXVIII

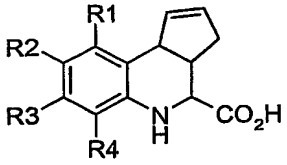
27. A compound represented by structural formula **I-a"**:



I-a"

or a pharmaceutically acceptable salt, solvate, or hydrate thereof, wherein Ring **B** is optionally substituted at any substitutable ring carbon, and Z is –H or a C1 to C4 alkyl group.

28. The compound of Claim 27, wherein the compound is represented by structural formula **I-a'**:



I-a'

wherein:

R1, R2, R3, and R4 are independently –H, halogen, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)O(CO)R^b$, $-(CS)OR^b$, $-(CS)R^b$, $-(SO)OR^b$, $-SO_3R^b$, $-OSO_3R^b$, $-P(OR^b)_2$, $-(PO)(OR^b)_2$, $-O(PO)(OR^b)_2$, $-B(OR^b)_2$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-SO_2NR^c_2$, $-NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl,

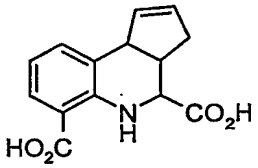
heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl, wherein at least one of R1 to R4 is -(CO)OR^b;

wherein:

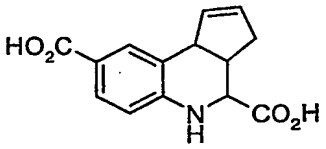
each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

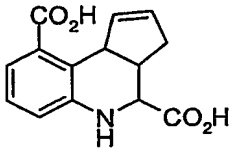
29. The compound of Claim 28, wherein the compound is represented by one of the following structural formulas:



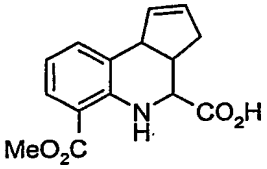
II



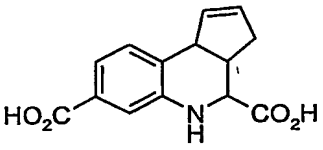
IV



VII

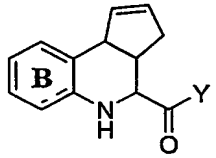


XX



XXI

30. A compound represented by structural formula I-b:



I-b

or a pharmaceutically acceptable salt, solvate, or hydrate thereof, wherein:

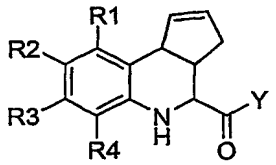
Ring **B** is optionally substituted at any substitutable ring carbon, provided that one or two substitutable ring carbons in Ring **B** are substituted with an acidic group; and

Y is optionally substituted C1 to C4 alkyl, C1 to C4 alkoxy, phenyl, pyridyl, or $-NR^j_2$;

wherein each R^j is independently –H, C1 to C4 alkyl, aryl, or aralkyl, or NR^j_2 is a nonaromatic heterocycle.

31. The compound of Claim 30 wherein the acidic group is selected from -(CO)OH, -(CS)OH, -(SO)OH, $-SO_3H$, $-OSO_3H$, $-P(OR^a)(OH)$, $-(PO)(OR^a)(OH)$, $-O(PO)(OR^a)(OH)$, or $-B(OR^a)(OH)$, wherein R^a is –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl.

32. The compound of Claim 31, wherein the compound is represented by structural formula **I-b'**:



I-b'

wherein:

R1, R2, R3, and R4 are independently –H, halogen, $-NO_2$, -CN, $-(CO)R^b$, $-(CO)OR^b$, $-(CO)O(CO)R^b$, $-(CS)OR^b$, $-(CS)R^b$, $-(SO)OR^b$, $-SO_3R^b$, $-OSO_3R^b$, $-P(OR^b)_2$, $-(PO)(OR^b)_2$, $-O(PO)(OR^b)_2$, $-B(OR^b)_2$, $-(CO)NR^c_2$, $-NR^c_2$, $-NR^d(CO)R^b$, $-NR^d(CO)OR^b$, $-NR^d(CO)NR^c_2$, $-SO_2NR^c_2$, $-NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl; provided that at least one of R1 to R4 is $-CO_2H$;

wherein

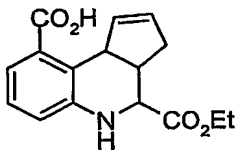
each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

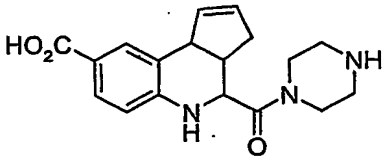
33. The compound of Claim 32 wherein at least two of R1 to R4 are –H.

34. The compound of Claim 33 wherein one of R1 to R4 is $-CO_2H$.

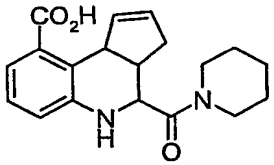
35. The compound of Claim 34, wherein the compound is represented by one of the following structural formulas:



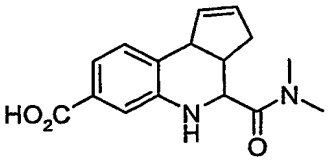
XIV



XXII

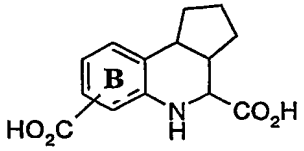


XXIV



XXVII

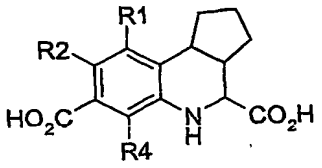
36. A compound represented by structural formula **I-c**:



I-c

or a pharmaceutically acceptable salt, solvate, or hydrate thereof, wherein Ring **B** is optionally substituted at any substitutable ring carbon.

37. The compound of Claim 36, wherein the compound is represented by structural formula **I-c'**:



I-c'

wherein:

R1, R2, and R4 are independently –H, halogen, -NO_2, -CN, -$(CO)R^b$, -$(CO)OR^b$, -$(CO)O(CO)R^b$, -$(CS)OR^b$, -$(CS)R^b$, -$(SO)OR^b$, -SO_3R^b, -OSO_3R^b, -$P(OR^b)_2$, -$(PO)(OR^b)_2$, -$O(PO)(OR^b)_2$, -$B(OR^b)_2$, –$(CO)NR^c_2$, -NR^c_2, -$NR^d(CO)R^b$, -$NR^d(CO)OR^b$, -$NR^d(CO)NR^c_2$, -$SO_2NR^c_2$, -$NR^dSO_2R^b$, or an optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, C3 to C7 cycloalkyl, nonaromatic heterocycle, C1 to C4 alkyl, C1 to C4 alkoxy, C1 to C4 hydroxy alkyl, or C2 to C6 alkoxyalkyl;

wherein:

each R^b and R^d is independently –H or optionally substituted aryl, aralkyl, heteroaryl, heteroaralkyl, or C1 to C4 alkyl; and

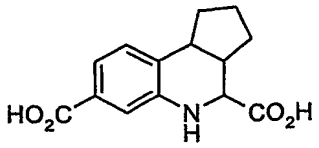
each R^c is independently –H or optionally substituted C1 to C4 alkyl, aryl, or aralkyl, or NR^c_2 is an optionally substituted nonaromatic heterocycle.

38. The compound of Claim 37, wherein R1, R2, and R4 are independently –H, -F, -Cl, -Br, -NO_2, -CN, -$(CO)R^b$, –$(CO)NR^c_2$, -NR^c_2, -$NR^d(CO)R^b$, -$NR^d(CO)OR^b$, -$NR^d(CO)NR^c_2$, -$SO_2NR^c_2$, -$NR^dSO_2R^b$, or optionally halogenated C1 to C4 hydroxy alkyl, C1 to C4 alkyl, or C1 to C4 alkoxy;

wherein each R^b, R^c and R^d is independently –H or C1 to C4 alkyl; or NR^c_2 is a nonaromatic heterocycle.

39. The compound of Claim 38 wherein two of R1, R2, and R4 are –H.

40. The compound of Claim 39 wherein the compound is represented by structural formula **I-m**:



I-m

41. A method of identifying a MurA inhibitor, comprising:

contacting MurA with phosphoenolpyruvate and a test compound;

determining a reaction rate between the phosphoenolpyruvate and MurA; and

identifying the test compound as a MurA inhibitor when the rate of reaction in the presence of the test compound is less than a reaction rate in the absence of the test compound.

42. The method of Claim 41, further comprising conducting the reaction in the presence of MurB and uridine 5'-diphospho-N-acetylglucosamine.